CHEMICALS
Project Fact Sheet

Distillation Column Flooding Predictor

Benefits

- Increases column stability
- Increased energy efficiency
- Predicts and avoids flood
- Energy savings estimated at 9.4 trillion Btu by 2020
- Estimated carbon emission reductions by 2020 at 0.11 MMTCE/yr
- Low implementation and maintenance costs

Applications

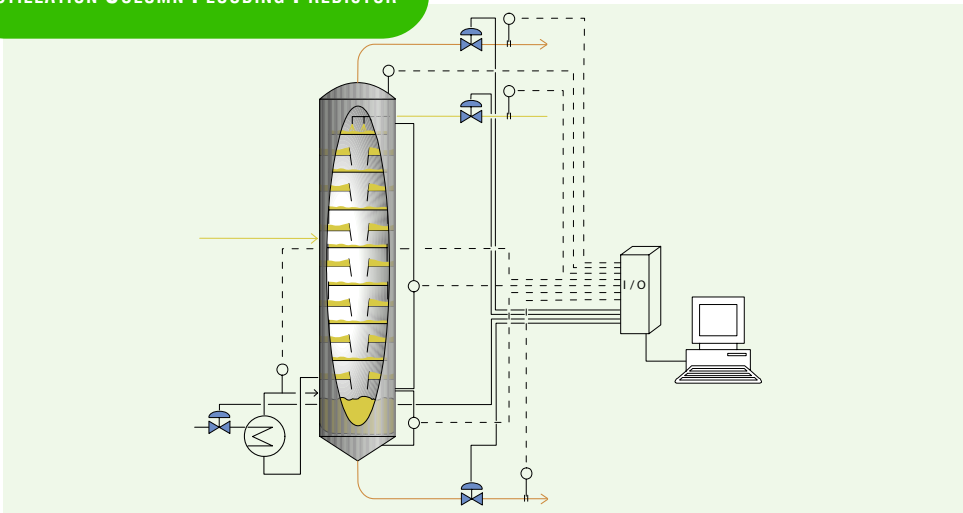
The Distillation Column Flooding Predictor is a unique advanced process control strategy for the petrochemical industry. Validation tests at the University of Texas at Austin, concluded the Flooding Predictor works well on both trayed and packed columns, the Flooding Predictor controls the column very close to the true flood point where highest efficiency and capacity occur, the Flooding Predictor can be installed on nearly any process control computer.

Distillation Column Flooding Predictor Will Have a Significant Impact on Energy Use in the Petrochemical Industry

The U.S. petroleum refining and chemical processing industries consume over 12 quadrillion Btu of energy each year. Distillation is a low thermal efficiency unit operation that currently accounts for 40 percent of the processing energy consumed in refining and chemical processes. In spite of its high energy requirements, distillation is often chosen over other separation processes because of its low initial capital investments, flexibility, and ability to yield high purity products. This high level of energy consumption and widespread utilization makes distillation column operation an extremely attractive area for optimization.

The Flooding Predictor is an advanced process control strategy that utilizes a patented pattern recognition system to identify pre-flood conditions in distillation, absorption, and stripping columns. The application of a Flooding Predictor could greatly increase the stability and energy efficiency in distillation column operation. Other benefits include lower implementation and maintenance costs and the unique ability to distinguish between different flooding mechanisms within the same tower (e.g., liquid and jet flooding). When potential flood conditions are avoided, column stability increases and column throughput can be increased. Widespread utilization of flooding predictors could save 2.4 trillion Btu of feedstock energy, 7 trillion Btu of heat/steam energy, and 0.11MMTCE/year in carbon emissions by 2020.

Distillation Column Flooding Predictor



A new advanced process control strategy for the petrol-chemical industry identifies and avoids flooding in separation columns, increases energy efficiency and maximizes throughput.

Project Description

Goal: To develop a universally useable tool that will maximize the separation yield of a distillation column.

The flooding predictor is an advanced process control strategy that utilizes a patented pattern recognition system to identify the onset of flood and pre-flood conditions in distillation and separation columns. This strategy briefly relaxes column severity at the pre-flood state, increasing the stability and energy efficiency of long-term operation. The pattern recognition system identifies transient tower instabilities, which precede flooding in trayed and packed columns. The strategy has the capability of distinguishing between a pre-flooding state and the random noise that is commonly generated from the natural frequency of the process. When column severity is relaxed briefly at the pre-flood state, the eventual flood condition is avoided, and the tower returns to a more stable state where throughput can be increased.

Progress and Milestones

A series of DOE-funded distillation tests in an 18-inch distillation column at the The University of Texas at Austin, proved the initial feasibility of using a pattern recognition methodology to permit stable column operation up to the incipient flood point of a trayed or packed column operating at total reflux. The new project tasks are outlined below.

- Pilot plant demonstration
- Dynamic model development
- Commercial scale validation
- Commercialization

Commercialization

Feasible commercialization paths include partnering with an industry leader of the technology, partnering with an established process control company, licensing the technology to a technology vendor, or direct licensing to the end user.

Project Partners

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St. John, Lake County, IN

University of Texas at Austin
Austin, TX

Shell Global Solutions (US)
Houston, TX

Motiva Enterprises L.L.C
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